Sarykamysh lakes. When this gulf began to desiccate, the Amu began to flow northwards, in its present bed. The other hypothesis, developed with great skill by M. Obrucheff ("The Transcaspian Lowlands," 1890), is that the Karakum gulf existed and received the Amu with its tributaries, the Murghab and the Tejen; when the gulf began to desiccate the Amu continued to flow that way and entered the Caspian, and only later began to flow northwards, sending a branch along the Uzboi.

In his new volume M. Konshin discusses this hypothesis in detail, and gives his arguments in favour of his own views. His chief arguments are, first, that the Caspian shells, belonging to species now living in that sea (*Dreissena*, *Hydrobia*, *Neretina*, and *Lithoglyphus*), are found in the southern parts of the Uzboi, uncovered by deposits of fluviatile origin, as also at the western entrance of the Karakum Gulf, where they are found at elevations of from 140 feet to (at least) 175 feet, and occasionally 280 feet, above the present level of the Caspian; and next, that the Karakum Sands bear no traces of fluviatile deposits or of the levelling action of water which would be apparent in case the Karakum Gulf had harboured a river after its desiccation. The hillocks, 150 feet to 250 feet high, which cover these sands, are marine dunes, and the elongated depressions filled with salt water (*shors*), which are considered as indicative of old river beds, have nowhere the regularity which old river beds would be possessed of. They are traces of a retreated sea.

It is evident that further exploration is wanted; but it must be acknowledged that the absence of river deposits in the Karakum Sands militates in favour of M. Konshin's views. P. K.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

PROF. R. B. OWENS, of the Nebraska University, has been appointed to the McDonald chair of Electrical Engineering in the McGill University, Montreal.

THE following appointments have been made in the School of Agriculture, Ghizeh, Egypt:—Senior Professor of Agriculture, Mr. H. J. Mohson, lecturer on agriculture and horticulture at the Yorkshire College, Leeds; Junior Professor of Agriculture, Mr. Andrew Linton, B.Sc. (Hons.), Durham University.

THE 1898-99 programme of technological examinations conducted by the City and Guilds of London Institute has just been published by Messrs. Whittaker and Co. The contents comprise syllabuses of the seventy subjects in which examinations are held, and copies of the papers set at this year's examinations. At the end of the syllabus of each subject is a list of works of reference, which must prove of great service to both teachers and students.

THE doctorates conferred by universities in the United States in 1897 are classified in *Science*, with the view to comparing the tendency of the work of the students. It is pointed out that the American university is definitely a place for research, where both teachers and students are engaged in research or in learning the methods of research. The results of the work of the students is, therefore, in large measure summarised by the theses for the doctorate, and it is interesting to know what is the outcome of the past year's research. It appears from the classified list referred to that eighteen leading universities conferred the Ph.D. degree on 234 candidates. Of this total number, no less than 105 degrees were conferred for scientific theses. The Humanities came next with 91 degrees, while History and Economics numbered only 38 degrees.

THE reports of inspectors on schools and classes under the Department of Science and Art, contained in the forty-fifth annual report of the Department, show that the teaching of science in the Government schools is undergoing distinct improvement. In the schools of science inspection has entirely taken the place of examination, at any rate in the elementary course, and this, by relieving the teacher of the strain entailed by preparation for examination at a prescribed date, has tended to sounder and more satisfactory work. It is being gradually realised that a school of science should be characterised more by a systematic course of study than by the mere possession of laboratories and apparatus. In classes in physics and chemistry a decided improvement in the methods of teaching is reported. Apparatus is more freely used than formerly, the teaching is less mechanical, and increased attention is being given to practical work. There can be no doubt that the practical instruction in these and other science subjects adds enormously to the value of the theoretical lessons, and it is to be hoped that the number of schools arranging for such work will increase year by year.

THE coordination of the work of the class-room and laborator was the subject of a paper read by Prof. Gaetono Lanza, Professor of Applied Mechanics, Massachusetts Institute of Technology, at the recent annual meeting of the American Society for the Promotion of Engineering Education. Prof. Lanza insisted that pure science and literature should not be neglected in an engineering education, and he pointed out that to impart to the student a thorough mastery of scientific principles far outweighs in importance anything else that can be done for him, and this is the chief function of an engineering course. The class-room work forms the basis of the course; and the laboratory work, to serve its purpose, must be based upon the class-room work which has preceded it, must be thoroughly co-ordinated with it, and must be made to depend upon it, to use it, and to serve as an aid to illustrate the principles involved. The functions of the engineering laboratory are partly to emphasise and illustrate the work of the class-room, partly to drill the students in performing carefully and accurately such experimental work as they are liable to be called upon to perform in the practice of their professions, and partly to teach them to carry on experimental investigation. In order to fulfil these purposes there should be an intimate relation between the class-room and the laboratory work, and the student should be made to work up the results of the tests in the light of what he has learned in the class-room. Prof. Lanza concluded by expressing the view that any organisation which does not tend to preserve the most intimate relation between the two, is not for the best interests of the student and should not exist.

SCIENTIFIC SERIALS.

Bulletin of the American Mathematical Society, vol. iv. No. 10, July.—The structure of the hypoabelian groups, by Dr. L. E. Dickson, gives a marked simplification both in the general conceptions and in the detailed developments of the theory of the two hypoabelian groups of Jordan and of the author's generalisation ("the first hypoabelian group generalised," *Q. J. of Mathematics*, 1898), to the Galois field of order 2^n of the first group. It is important, for the generalisation, to give these groups an abstract definition independent of the theory of "exposants d'échange," by means of which Jordan derived them. The crucial point in the simplified treatment lies in the discovery of the explicit relations

$$\sum_{i,j}^{1\ldots m} a^{(i)} \delta^{(i)}_{j} = m, \sum_{i,j}^{1\ldots m} a^{(i)}_{j} \delta^{(i)}_{j} + \alpha'_1 + \beta'_1 + \gamma'_1 + \delta'_1 = m,$$

satisfied by the substitutions of the simple sub-groups J and J_1, respectively, but ruling out the remaining substitutions of the total hypoabelian groups G and G_1. The paper was read in abstract at the Chicago meeting, April 9.—The following five papers were read at the meeting of the Society held on April 30 (for an account of five other papers read at the same meeting, see vol. lviii. No. 1500, p. 310).—On the Hamilton groups, by Dr. G. A. Miller. Dedekind's definition of such a group is that it is a non-Abelian group, all of whose sub-groups are self-conjugate. If the order of such a group is $p_1^{a_1} p_2^{a_2} p_3^{a_3} \ldots$ ($p_1, p_2, p_3 \ldots$ being prime numbers) it must be the direct product of its sub-groups of orders $p_1^{a_1}$, $p_2^{a_2}$, $p_3^{a_3}$, . . . since each of these sub-groups is self-conjugate, and no two of them can have any common operator except identity (*Math. Annal.*, vol. xxii. p. 97). Each of these sub-groups is either Abelian or Hamiltonian. Dr. Miller proceeds to show that one of the given prime numbers must be 2, and that every sub-group whose order is a power of any other prime number must be Abelian. The results are conveniently summarised at the end of the short paper.—Note on the infinitesimal projective transformation, by Prof. E. O. Lovett. The writer proposes to find the form of the most general infinitesimal projective transformation of ordinary space directly from its simplest characteristic geometric property. Geometrically, these transformations are those infinitesimal point transformations which transform a plane into a plane, *i.e.* which leave invariant the family of ∞^3 planes of ordinary space.—Prof. Lovett contributes a further note on infinitesimal transformations of concentric conics. He defines a family of curves to be invariant under the transformations of a continuous group of transformations when the family is invariant under the

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infinitesimal transformations which generate the group A family is invariant under an infinitesimal transformation when the differential equation of the family admits of the infinitesimal transformation. He states the criterion, and points out that the converse problem is an integration problem not capable of general solution.—A solution of the biquadratic by binomial resolvents, by Dr. G. P. Starkweather, claims to be a new solution in which the roots are given explicitly, and to be an interesting application of Galois' methods.—Mr. H. E. Hawkes, in "Limitations of Greek Arithmetic," discusses the number system of the Greeks, and shows how their arithmetical notions were limited by their geometrical symbolism. The argument is mainly based on Euclid's Elements.—There are some further notes: viz. note on special regular reticulations, by Prof. E. W. Davis. In his remarks on maxima and minima of functions of several variables, Prof. J. Pierpont points out a flaw in the treatment of this theory in the treatises of Todhunter, Williamson and Byerly, and calls attention to the results of Scheefers, Stolz and von Dantscher, which find a place in the Cours d'Analyse of M. C. Jordan.—On the intersections of plane curves, by F. S. Macaulay, discusses further some interesting points raised in Miss Scott's paper on Mr. Macaulay's "point groups in relation to curves" (of March number of the *Bulletin*).—In addition to four minor notices and reviews, and the notes, index, &c., there is a list of the papers read before the Society, with references to the journals in which they have been published.

American Journal of Science, August.—The origin and significance of spines, Part 2, by C. E. Beecher. Most organisms have certain parts which are more exposed to the forces of the environment than others, and such exposed parts, when acted upon by hereditary requirements, produce the various external organs and appendages. When such a hereditary predisposition is absent, the normal responsive action between growth and stimulus tends to produce a conical or spiniform growth. Other conditions favourable to the development of spines are restraint of environment, causing suppression of highly developed structures, and deficiency of growth force, causing degeneration of organs, such as leaves into spines representing the mid-rib, branches into spiniform twigs, legs or digits into spines.—The prehistoric fauna of Block Island as indicated by its ancient shell-heaps, by G. F. Eaton. Block Island is situated off the New England coast, to the east of Long Island. Three ancient shell-heaps were explored, which yielded valuable finds. Bones of the great auk were found in two of them, and in one, part of the skull of the grey seal. The human remains discovered show little variation from the type of the New England Indian. The remains of a child show distinct traces of a violent death, and the absence of the arms and a portion of the lower limbs points to the practice of cannibalism. Stone implements were also discovered, and some highly finished articles made of bone. The fauna generally is of a continental character, and indicates a former connection of the island with the mainland.—A registering solar radiometer and sunshine recorder, by G. S. Isham. Two barometer tubes are suspended by the arms of a balance. They contain mercury and saturated alcohol vapour. One of them is blackened and exposed to sunlight, which increases the pressure of the alcohol vapour and expels some mercury. The motion of the beam is recorded by a pen travelling across a divided scale moved by clockwork.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, August 22.—M. Wolf in the chair.—Observations of the planet 1898 DQ (Witt, 1898 August 14), made at the Paris Observatory, by M. Jean Mascart. The magnitude of the planet in question is about 10·5. Its apparent position was determined six times between August 18 and 20.—On the groups contained in motion of any kind, by M. G. Ricci.—Melting points of some substances under high pressures, by M. E. Mack. The apparatus used gave a range of pressure from 150 to 2140 atmospheres, and fourteen determinations of the melting-point of naphthalene were made at pressures between these two extremes. The results could be expressed with sufficient accuracy by the formula $t = 79{\cdot}8 + 0{\cdot}0373\,p - 0{\cdot}0000019\,p^2$, and the last term being very small, the increase in the melting-point is nearly proportional to the pressure. Measurements were also made with α-naphthylamine, diphenylamine, and paratoluidine, the results generally lying on a straight line, no indications being obtained of the maxima noticed by previous experimenters.—On the oxides of sodium, by M. de Forcrand. By heating sodium in a slow current of dry air, a greyish suboxide of sodium is formed, having the composition Na_3O. This, however, could not be obtained pure and unmixed with sodium. Further treatment with air gives Na_2O and Na_2O_2, but the former could not be obtained even approximately pure.—On the ammoniacal chlorides of lithium, by M. J. Bonnefoi. Pure dry LiCl, kept at a temperature above 85°, absorbs ammonia, giving $LiCl.NH_3$, the dissociation pressures of which were measured at four temperatures. The application of Clapeyron's formula to these measurements gave a value for the latent heat of dissociation in close agreement with that found experimentally. Between 60° and 85°, $LiCl2NH_3$ is formed; between 20° and 60°, $LiCl3NH_3$; and at 13°, $LiCl4NH_3$. In all cases the results given by Clapeyron's formula agreed well with the direct thermochemical data.—The estimation of tannin, by M. Leo Vignon. The tannin is absorbed from solution by silk, and the loss determined either by drying at 110°, or by titrating the solution with permanganate. Test analyses show a good agreement with those obtained by methods previously used (Sisley, Aimé Girard).—On the composition of phosphorescent sulphides of strontium, by M. J. R. Mourelo. The phosphorescent sulphide contains small proportions of strontium sulphate, sodium sulphide and chloride, and bismuth sulphide and oxide; and the presence of these impurities appears to be a necessary condition for a brilliant and lasting phosphorescence.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Zoological Results based on Material from New Britain, &c., collected during the Years 1895, 1896, and 1897, Part 1: Dr. A. Willey (Cambridge University Press).—City and Guilds of London Institute Programme of Technological Examinations, Session 1898–99 (Whittaker).—Geology for Beginners: W. W. Watts (Macmillan).—Plant Life: Prof. C. R. Barnes (N.Y., Holt).—Special Report on the Beet-Sugar Industry of the United States (Washington).

PAMPHLETS.—Deductive Series of Arithmetical Problems, Standards 3 to 7 (Reading, National Publishing Association, Ltd.).—Mines and Quarries: General Report and Statistics for 1897. Part 2. Labour (Eyre).

SERIALS.—Good Words, September (Isbister).—Sunday Magazine, September (Isbister).—English Illustrated Magazine, September (198 Strand).—Chambers's Journal, September (Chambers).—Longman's Magazine, September (Longmans).—Century Magazine, September (Macmillan).—Atti del Reale Istituto d'Incorraggiamento di Napoli, 4te serie, Vol. x. (Napoli).—Johns Hopkins University Studies, ser. xvi. Nos. 7, 8, 9 (Baltimore).—Natural Science, September (Dent).—Contemporary Review, September (Isbister).

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